



## mitochondrial encephalomyopathy, lactic acidosis, and stroke-like episodes

Mitochondrial encephalomyopathy, lactic acidosis, and stroke-like episodes (MELAS) is a condition that affects many of the body's systems, particularly the brain and nervous system (encephalo-) and muscles (myopathy). The signs and symptoms of this disorder most often appear in childhood following a period of normal development, although they can begin at any age. Early symptoms may include muscle weakness and pain, recurrent headaches, loss of appetite, vomiting, and seizures. Most affected individuals experience stroke-like episodes beginning before age 40. These episodes often involve temporary muscle weakness on one side of the body (hemiparesis), altered consciousness, vision abnormalities, seizures, and severe headaches resembling migraines. Repeated stroke-like episodes can progressively damage the brain, leading to vision loss, problems with movement, and a loss of intellectual function (dementia).

Most people with MELAS have a buildup of lactic acid in their bodies, a condition called lactic acidosis. Increased acidity in the blood can lead to vomiting, abdominal pain, extreme tiredness (fatigue), muscle weakness, and difficulty breathing. Less commonly, people with MELAS may experience involuntary muscle spasms (myoclonus), impaired muscle coordination (ataxia), hearing loss, heart and kidney problems, diabetes, and hormonal imbalances.

### Frequency

The exact incidence of MELAS is unknown. It is one of the more common conditions in a group known as mitochondrial diseases. Together, mitochondrial diseases occur in about 1 in 4,000 people.

### Genetic Changes

MELAS can result from mutations in one of several genes, including *MT-ND1*, *MT-ND5*, *MT-TH*, *MT-TL1*, and *MT-TV*. These genes are found in the DNA of cellular structures called mitochondria, which convert the energy from food into a form that cells can use. Although most DNA is packaged in chromosomes within the nucleus, mitochondria also have a small amount of their own DNA, known as mitochondrial DNA or mtDNA.

Some of the genes related to MELAS provide instructions for making proteins involved in normal mitochondrial function. These proteins are part of a large enzyme complex in mitochondria that helps convert oxygen, fats, and simple sugars to energy. Other genes associated with this disorder provide instructions for making molecules called transfer RNAs (tRNAs), which are chemical cousins of DNA. These molecules help assemble

protein building blocks called amino acids into full-length, functioning proteins within mitochondria.

Mutations in a particular transfer RNA gene, *MT-TL1*, cause more than 80 percent of all cases of MELAS. These mutations impair the ability of mitochondria to make proteins, use oxygen, and produce energy. Researchers have not determined how changes in mtDNA lead to the specific signs and symptoms of MELAS. They continue to investigate the effects of mitochondrial gene mutations in different tissues, particularly in the brain.

## **Inheritance Pattern**

This condition is inherited in a mitochondrial pattern, which is also known as maternal inheritance. This pattern of inheritance applies to genes contained in mtDNA. Because egg cells, but not sperm cells, contribute mitochondria to the developing embryo, children can only inherit disorders resulting from mtDNA mutations from their mother. These disorders can appear in every generation of a family and can affect both males and females, but fathers do not pass traits associated with changes in mtDNA to their children.

In most cases, people with MELAS inherit an altered mitochondrial gene from their mother. Less commonly, the disorder results from a new mutation in a mitochondrial gene and occurs in people with no family history of MELAS.

## **Other Names for This Condition**

- MELAS
- MELAS syndrome
- mitochondrial myopathy, encephalopathy, lactic acidosis, and stroke-like episodes
- mitochondrial myopathy, lactic acidosis, stroke-like episode
- myopathy, mitochondrial-encephalopathy-lactic acidosis-stroke

## **Diagnosis & Management**

### Genetic Testing

- Genetic Testing Registry: Juvenile myopathy, encephalopathy, lactic acidosis AND stroke  
<https://www.ncbi.nlm.nih.gov/gtr/conditions/C0162671/>

### Other Diagnosis and Management Resources

- GeneReview: MELAS  
<https://www.ncbi.nlm.nih.gov/books/NBK1233>
- GeneReview: Mitochondrial Disorders Overview  
<https://www.ncbi.nlm.nih.gov/books/NBK1224>

- MedlinePlus Encyclopedia: Lactic acidosis  
<https://medlineplus.gov/ency/article/000391.htm>
- MedlinePlus Encyclopedia: Stroke  
<https://medlineplus.gov/ency/article/000726.htm>
- National Organization for Rare Disorders (NORD) Physician Guide: Mitochondrial Myopathies  
<http://nordphysicianguides.org/mitochondrial-myopathies-mm/>

#### General Information from MedlinePlus

- Diagnostic Tests  
<https://medlineplus.gov/diagnostictests.html>
- Drug Therapy  
<https://medlineplus.gov/drugtherapy.html>
- Genetic Counseling  
<https://medlineplus.gov/geneticcounseling.html>
- Palliative Care  
<https://medlineplus.gov/palliativecare.html>
- Surgery and Rehabilitation  
<https://medlineplus.gov/surgeryandrehabilitation.html>

### **Additional Information & Resources**

#### MedlinePlus

- Encyclopedia: Lactic acidosis  
<https://medlineplus.gov/ency/article/000391.htm>
- Encyclopedia: Stroke  
<https://medlineplus.gov/ency/article/000726.htm>
- Health Topic: Genetic Brain Disorders  
<https://medlineplus.gov/geneticbraindisorders.html>
- Health Topic: Mitochondrial Diseases  
<https://medlineplus.gov/mitochondrialdiseases.html>
- Health Topic: Neuromuscular Disorders  
<https://medlineplus.gov/neuromusculardisorders.html>
- Health Topic: Stroke  
<https://medlineplus.gov/stroke.html>

### Genetic and Rare Diseases Information Center

- Mitochondrial encephalomyopathy lactic acidosis and stroke-like episodes  
<https://rarediseases.info.nih.gov/diseases/7009/mitochondrial-encephalomyopathy-lactic-acidosis-and-stroke-like-episodes>

### Additional NIH Resources

- National Institute of Neurological Disorders and Stroke  
<https://www.ninds.nih.gov/Disorders/All-Disorders/Mitochondrial-myopathy-Information-Page>

### Educational Resources

- Kennedy Krieger Institute  
<https://www.kennedykrieger.org/patient-care/diagnoses-disorders/mitochondrial-disorders>
- MalaCards: melas syndrome  
[http://www.malacards.org/card/melas\\_syndrome](http://www.malacards.org/card/melas_syndrome)
- My46 Trait Profile  
<https://www.my46.org/trait-document?trait=Mitochondrial%20Encephalomyopathy,%20Lactic%20Acidosis,%20and%20Stroke-Like%20Episodes&type=profile>
- Neuromuscular Disease Center, Washington University  
<http://neuromuscular.wustl.edu/mitosyn.html#melas>
- Orphanet: MELAS  
[http://www.orpha.net/consor/cgi-bin/OC\\_Exp.php?Lng=EN&Expert=550](http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=550)

### Patient Support and Advocacy Resources

- Children Living with Inherited Metabolic Diseases (CLIMB) (UK)  
<http://www.climb.org.uk/>
- Children's Mitochondrial Disease Network (UK)  
<http://www.cmdn.org.uk/>
- MitoAction  
<http://www.mitoaction.org>
- Muscular Dystrophy Association: Facts About Mitochondrial Myopathies  
[https://www.mda.org/sites/default/files/publications/Facts\\_MITO\\_P-216.pdf](https://www.mda.org/sites/default/files/publications/Facts_MITO_P-216.pdf)
- National Organization for Rare Disorders (NORD)  
<https://rarediseases.org/rare-diseases/melas-syndrome/>

- Resource List from the University of Kansas Medical Center  
<http://www.kumc.edu/gec/support/mitochon.html>
- United Mitochondrial Disease Foundation  
<http://www.umdf.org/>

#### GeneReviews

- MELAS  
<https://www.ncbi.nlm.nih.gov/books/NBK1233>
- Mitochondrial Disorders Overview  
<https://www.ncbi.nlm.nih.gov/books/NBK1224>

#### ClinicalTrials.gov

- ClinicalTrials.gov  
<https://clinicaltrials.gov/ct2/results?cond=%22mitochondrial+encephalomyopathy%2C+lactic+acidosis%2C+and+strokeline+episodes%22+OR+%22MELAS+Syndrome%22>

#### Scientific Articles on PubMed

- PubMed  
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28mitochondrial+encephalomyopathy,+lactic+acidosis,+and+strokeline+episodes%29+OR+%28MELAS+syndrome%5BMAJR%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D>

#### OMIM

- MITOCHONDRIAL MYOPATHY, ENCEPHALOPATHY, LACTIC ACIDOSIS, AND STROKE-LIKE EPISODES  
<http://omim.org/entry/540000>

### **Sources for This Summary**

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